AMENDMENTS TO THE CLAIMS

Applicant has amended Claims 1, 10, 12, 13, 15, 16, 19 and 32 in the following listing. Added text is underlined and deleted text is stricken-through. This listing of claims will replace all prior versions and listings of claims in the application.

1. (Currently Amended) A method of processing an image of an eye, the method comprising:

providing data representing an image of an eye comprising an image of an iris of the eye, the iris image being ~~substantially annular and~~ defined between inner and outer boundaries, the eye image comprising a plurality of pixels, the eye image data comprising location information and image information for each pixel of the eye image;

providing location information of the inner boundary of the iris image, wherein a first inner boundary pixel and a second inner boundary pixel are located at different points on the inner boundary;

finding a first outer boundary pixel located on a first imaginary line extending from the first inner boundary pixel, wherein a pixel located on the first imaginary line is determined to be the first outer boundary pixel when the difference of the image information between the pixel and its neighboring pixel which are located on the first imaginary line becomes the maximum among differences of the image information between two neighboring pixels located on the first imaginary line;

finding a second outer boundary pixel located on a second imaginary line extending from the second inner boundary pixel, wherein a pixel located on the second imaginary line is determined to be the second outer boundary pixel when the difference of the image information between the pixel and its neighboring pixel which are located on the second imaginary line becomes the maximum among differences of the image information between two neighboring pixels located on the second imaginary line; and

using at least one of the first outer boundary pixel and the second outer boundary pixel for further processing.

~~comparing the image information of a pixel on the inner boundary with the image information of pixels of the eye image; and~~

~~determining a pixel is on the outer boundary of the iris image when a difference between the image information of that pixel and the image information of the pixel on the inner boundary becomes a maximum among differences of the image information.~~

2. (Original) The method of Claim 1, wherein the location information of the inner boundary is obtained with use of a Canny edge detection method.

3. (Previously Presented) The method of Claim 1, further comprising:

obtaining data of a substantial portion, but not all, of the iris image; and

processing the data of the substantial portion to obtain an iris pattern.

4. (Previously Presented) The method of Claim 3, wherein the data comprises the location information and the image information of a pixel within the portion.

5. (Original) The method of Claim 3, wherein the substantial portion of the iris image is from about 25% to about 95% of an area of the iris image.

6. (Original) The method of Claim 3, wherein the substantial portion of the iris image is from about 40% to about 85% of an area of the iris image.

7. (Original) The method of Claim 3, wherein the substantial portion of the iris image is from about 50% to about 75% of an area of the iris image.

8. (Original) The method of Claim 3, wherein the substantial portion of the iris image is from about 55% to about 65% of an area of the iris image.

9. (Original) The method of Claim 3, wherein the substantial portion of the iris image is substantially annular.

10. (Currently Amended) The method of Claim 3, wherein the substantial portion is substantially annular and defined from the inner boundary to an imaginary closed line between the inner and outer boundaries.

11. (Original) The method of Claim 10, wherein the imaginary closed line is substantially parallel to the inner boundary.

12. (Currently Amended) The method of Claim 11, wherein a tangent at a point on the inner boundary is substantially parallel to a tangent at a point on the imaginary closed line that is on a line perpendicular to the tangent at the point on the inner boundary.

13. (Currently Amended) The method of Claim 3, wherein the substantial portion is substantially annular and defined from an imaginary closed line between the inner and outer boundaries to the outer boundary.

14. (Original) The method of Claim 13, wherein the imaginary closed line is substantially parallel to the outer boundary.

15. (Currently Amended) The method of Claim 3, wherein the substantial portion is substantially annular and defined between a first imaginary closed line and a second imaginary closed line, wherein the first imaginary closed line is drawn between the inner and outer boundaries, and wherein the second imaginary closed line is drawn between the first imaginary closed line and the outer boundary.

16. (Currently Amended) The method of Claim 15, wherein the first and second imaginary closed lines are substantially parallel to each other.

17. (Original) The method of Claim 3, wherein the substantial portion of the iris image is not annular.

18. (Original) The method of Claim 3, wherein the data of the substantial portion is transformed into a polar coordinate form.

19. (Currently Amended) A device for processing an image of an eye, comprising:

means for providing data representing an image of an eye comprising an image of an iris of the eye, the iris image being ~~substantially annular and~~ defined between inner and outer boundaries, the eye image comprising a plurality of pixels, the eye image data comprising location information and image information for each pixel of the eye image;

means for providing location information of the inner boundary of the iris image, wherein a first inner boundary pixel and a second inner boundary pixel are located at different points on the inner boundary;

means for finding a first outer boundary pixel located on a first imaginary line extending from the first inner boundary pixel, wherein a pixel located on the first imaginary line is determined to be the first outer boundary pixel when the difference of the image information between the pixel and its neighboring pixel which are located on the first imaginary line becomes the maximum among differences of the image information between two neighboring pixels located on the first imaginary line;

means for finding a second outer boundary pixel located on a second imaginary line extending from the second inner boundary pixel, wherein a pixel located on the second imaginary line is determined to be the second outer boundary pixel when the difference of the image information between the pixel and its neighboring pixel which are located on the second imaginary line becomes the maximum among differences of the image information between two neighboring pixels located on the second imaginary line;

~~means for comparing the image information of a pixel on the inner boundary with the image information of pixels of the eye image, thereby determining a pixel is on the outer boundary of the iris image when a difference between the image information of that pixel and the image information of the pixel on the inner boundary becomes a maximum among differences of the image information;~~

means for obtaining data of a substantial portion, but not all, of the iris image; and

means for processing the data of the substantial portion to obtain an iris pattern.

20. (Previously Presented) An eye image processing system, comprising:

a first circuit configured to process the method of Claim 1 and configured to identify data of the iris image from the image of the eye; and

a second circuit configured to process the iris image data so as to obtain data of a substantial portion, but not all, of the iris image for further processing.

21. (Previously Presented) The system of Claim 20, wherein the first and second circuits are integrated in a circuit board or a chip.

22. (Previously Presented) The system of Claim 20, further comprising

a third circuit configured to process the data of the substantial portion of the iris image so as to determine whether the data of the iris image matches a pre-registered data.

23. (Previously Presented) The method of Claim 1, further comprising:

obtaining data of the iris image; and

producing at least one modified iris image data with use of the data of the iris image, the modified iris image data representing an iris image that is rotated by an angle about a point on the iris image.

24. (Previously Presented) The method of Claim 23, wherein the point of rotation is located at a substantially central position of the image of the iris.

25. (Previously Presented) The method of Claim 23, further comprising processing the iris image data to determine whether the iris image data matches a pre-registered iris image data.

26. (Original) The method of Claim 23, further comprising processing the modified iris image data to determine whether the modified iris image data matches a pre-registered iris image data.

27. (Original) The method of Claim 23, wherein the modified iris image data represents an iris image that is rotated in a clockwise direction.

28. (Original) The method of Claim 23, wherein the modified iris image data represents an iris image that is rotated in a counter-clockwise direction.

29. (Original) The method of Claim 23, wherein a plurality of modified iris image data are produced.

30. (Original) The method of Claim 23, wherein the modified iris image data is processed in accordance with a wavelet transform method.

31. (Original) The method of Claim 23, wherein the original iris image data is processed in accordance with a wavelet transform method.

32. (Currently Amended) An eye image processing system, comprising:

means for providing data representing an image of an eye comprising an image of an iris of the eye, the iris image being ~~substantially annular and~~ defined between inner and outer boundaries, the eye image comprising a plurality of pixels, the eye image data comprising location information and image information for each pixel of the eye image;

means for providing location information of the inner boundary of the iris image, wherein a first inner boundary pixel and a second inner boundary pixel are located at different points on the inner boundary;

means for finding a first outer boundary pixel located on a first imaginary line extending from the first inner boundary pixel, wherein a pixel located on the first imaginary line is determined to be the first outer boundary pixel when the difference of the image information between the pixel and its neighboring pixel which are located on the first imaginary line becomes the maximum among differences of the image information between two neighboring pixels located on the first imaginary line;

means for finding a second outer boundary pixel located on a second imaginary line extending from the second inner boundary pixel, wherein a pixel located on the second imaginary line is determined to be the second outer boundary pixel when the difference of the image information between the pixel and its neighboring pixel which are located on the second imaginary line becomes the maximum among differences of the image information between two neighboring pixels located on the second imaginary line;

~~means for comparing the image information of a pixel on the inner boundary with the image information of pixels of the eye image, thereby determining a pixel is on the outer boundary of the iris image when a difference between the image information of that pixel and the image information of the pixel on the inner boundary becomes a maximum among differences of the image information;~~

means for identifying data of the iris image; and

means for producing at least one modified iris image data based on the data of the iris image, the modified iris image data representing an iris image that is rotated by an angle about a point on the image.

33. (Original) The device of Claim 32, further comprising:

means for determining whether the modified iris image data matches a pre-registered data.

34. (Previously Presented) An eye image processing system, comprising:

a first circuit configured to process the method of Claim 1 and configured to identify data of the iris image from the image of the eye; and

a second circuit configured to process the iris image data so as to produce at least one modified iris image data based on the data of the original iris image, the modified iris image data representing an iris image that is rotated by an angle about a point on the original image.

35. (Previously Presented) The system of Claim 34, further comprising:

a third circuit configured to process the modified iris image data to determine whether the modified iris image data matches a pre-registered data.

36. (New) The method of Claim 1, wherein a third inner boundary pixel is located at a different point on the inner boundary from the points on the inner boundary where the first

inner boundary pixel and the second inner boundary pixel are located, and wherein the method further comprises finding a third outer boundary pixel located on a third imaginary line extending from the third inner boundary pixel, wherein a pixel located on the third imaginary line is determined to be the third outer boundary pixel when the difference of the image information between the pixel and its neighboring pixel which are located on the third imaginary line becomes the maximum among differences of the image information between two neighboring pixels located on the third imaginary line.

37. (New) The method of Claim 36, wherein the outer boundary is determined to be a generally circular line on which the first, second and third outer boundary pixels located.

38. (New) The method of Claim 36, wherein a fourth inner boundary pixel is located at a different point on the inner boundary from the points on the inner boundary where the first, second and third inner boundary pixels are located, and wherein the method further comprises finding a fourth outer boundary pixel located on a fourth imaginary line extending from the fourth inner boundary pixel, wherein a pixel located on the fourth imaginary line is determined to be the fourth outer boundary pixel when the difference of the image information between the pixel and its neighboring pixel which are located on the fourth imaginary line becomes the maximum among differences of the image information between two neighboring pixels located on the fourth imaginary line, wherein the first imaginary line is substantially perpendicular to the third and fourth imaginary lines, and wherein the second imaginary line is substantially perpendicular to the third and fourth imaginary lines.

SUMMARY OF INTERVIEW

Applicant thanks Examiners Jonathan C. Schaffer and Joseph Mancuso for the interview granted to Applicant's Representatives, Mincheol Kim and Hochan Song, on April 10, 2007.

Exhibits and/or Demonstrations

None.

Identification of Claims Discussed

Claim 1.

Identification of Prior Art Discussed

Daugman (U.S. Patent No. 5,291,560).

Proposed Amendments

- Applicant's Representatives proposed amending Claim 1 as set forth above.

Principal Arguments and Other Matters

- Applicant's representatives submitted that Daugman does not discloses the features of (1) finding a first outer boundary pixel located on a first imaginary line extending from a first inner boundary pixel by using differences of the image information between two neighboring pixels located on the first imaginary line; and (2) finding a second outer boundary pixel located on a second imaginary line extending from a second inner boundary pixel by using differences of the image information between two neighboring pixels located on the second imaginary line.
- The Examiners suggested that Applicant incorporate in Claim 1 the limitation of "using at least one of the first and second outer boundary pixels for further processing" to avoid possible 35 U.S.C. § 101 rejection.

Results of Interview

The Examiners and Applicant's Representatives agreed that:

- Daugman does not anticipate the proposed Claim 1;
- The incorporation of the limitation "using at least one of the first and second outer boundary pixels for further processing" to Claim 1 will avoid the 35 U.S.C. § 101 rejection; and
- If Request for Continued Examination with the proposed amendments is filed, the first office action will not be made final.